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Dairy Herd Improvement Letter

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NATIONAL COOPERATIVE
DAIRY HERD IMPROVEMENT
PROGRAM
A dairy recordkeeping plan
for every herd

- Changes in Genetic Evaluation Procedures for January 1984
- Counts of 305-Day Lactation Records Excluded From Genetic Evaluations for 1983
- State and National Standardized Lactation Averages by Breed for Cows on Official Test, Calving in 1982

U.S. Department of Agriculture
Agricultural Research Service

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Dairy Herd Improvement Letter

CHANGES IN GENETIC EVALUATION PROCEDURES FOR JANUARY 1984

By George R. Wiggans, H. Duane Norman, and Rex L. Powell[1]

In January 1984, the bases for sire and cow evaluations were updated by the Animal Improvement Programs Laboratory so that the average genetic merit of sires of 2-year-old cows calving for the first time in 1982 was zero. Bases were set separately by breed and trait--milk, fat, protein, and solids-not-fat (SNF). The new bases for Predicted Differences (PD's) and Cow Indexes (CI's) are called PD82 and CI82. Base changes for PD's are in tables 1 and 2 by breed. Procedures were changed for computing protein and SNF evaluations, adjusting CI's for average merit of dams of modified contemporaries, reporting percentiles and ancestor merit, and editing records.

Table 1.--Base changes for Predicted Differences (PD's) for milk and fat yields, fat percentage, and dollars (PD$) by breed

Breed	PD milk	PD fat	PD fat	PD$
	Pounds	*Pounds*	*Percent*	
Ayrshire	637	22	-0.02	76
Guernsey	781	30	-.07	100
Holstein	978	28	-.05	110
Jersey	993	34	-.16	122
Brown Swiss	1,094	35	-.07	130
Milking Shorthorn	992	41	+.04	132
Red and White	107	3	-.01	4

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Table 2.--Base changes for Predicted Differences (PD's) for yield, percentage, and dollars (PD$) for protein and solids-not-fat (SNF) by breed

Breed	PD protein	PD protein	PD$ protein	PD SNF	PD SNF	PD$ SNF
	Pounds	*Percent*		*Pounds*	*Percent*	
Ayrshire	19	-0.02	81	54	-0.03	79
Guernsey	25	-.03	103	68	-.03	105
Holstein	27	-.03	107	81	-.01	111
Jersey	34	-.04	126	89	-.04	128
Brown Swiss	39	+.01	137	102	+.03	140
Milking Shorthorn	30	-.00	133	---	---	---
Red and White	2	+.02	3	---	---	---

Calculation of PD's for Protein and SNF

Effective with the January 1984 Sire Summary, some changes were made in the procedure for calculating PD's for protein (PDP) and SNF (PD SNF). Using protein data collected through the National Cooperative Dairy Herd Improvement Program, equations were developed for predicting protein yield of cows from milk and fat yields:

$$\text{Estimated protein yield} = \text{Intercept} + b_1 \text{ (milk yield)} + b_2 \text{ (fat yield)}$$

where the b's are the protein coefficients in table 3. For example, for an Ayrshire with 13,000 pounds of milk and 520 pounds of fat, estimated protein yield = 14.15 + 0.0233814 (13,000) + 0.215052 (520) = 429.94 pounds. A similar procedure was used to estimate SNF yields, with the SNF coefficients also in table 3 by breed.

These prediction equations were used to set the 1982 genetic bases for protein and SNF for each breed. Records from all first-lactation sire-identified cows calving in 1982 were included in setting the new genetic bases for milk and fat. Because many of the cows that were tested for milk and fat were not tested for protein or SNF, these prediction equations provided a way to make the bases equivalent for all component traits. The base was set for protein evaluations by forcing the average PDP for bulls evaluated directly (those with little information from daughters are evaluated later) to equal the average estimated PDP calculated by

$$\text{estimated PDP} = b_1 \text{ PDM} + b_2 \text{ PDF}$$

where the b's are the coefficients in table 3, PDM = PD milk, and PDF = PD fat, where the PD's were by the Modified Contemporary Comparison (MCC) procedure. The intercept is not included because PD's are defined as the deviations from breed averages and the intercepts cancel out.

Table 3.--Coefficients (b's) for predicting protein and solids-not-fat (SNF) by breed

Component	Breed	Intercept[1]	b_1	b_2
Protein	Ayrshire	14.15	0.0233814	0.215052
	Guernsey	10.44	.0226375	.256000
	Holstein	19.58	.0236162	.185246
	Jersey	24.27	.0252764	.213545
	Brown Swiss	16.34	.0222398	.285633
	Milking Shorthorn	17.09	.0200552	.292116
	Red and White	7.11	.0224831	.239944
SNF	Ayrshire	22.68	.0765184	.267184
	Guernsey	12.82	.0794981	.229118
	Holstein	12.66	.0742099	.304047
	Jersey	.93	.0812947	.256132
	Brown Swiss	-1.76	.0789940	.309003
	Milking Shorthorn	-16.40	.0706282	.570832
	Red and White	-116.57	.0851449	.222717

[1] Should not be used for predicting deviation.

For the January 1984 genetic evaluations provided to the dairy industry, the PDP's for bulls with at least 40-percent Repeatability for protein were calculated by

$$PDP_{published} = PDP_{subset} + b_1 \, (PDM_{MCC} - PDM_{subset}) + b_2 \, (PDF_{MCC} - PDF_{subset})$$

where the PD_{subset} is based on daughter records with protein information, the b's are the coefficients in table 3, and the PD_{MCC} is based on all daughter records. As in the past, the PD_{subset} was calculated by best linear unbiased prediction procedures[2] with relationships included. A similar procedure was used to calculate PD for SNF.

Breed averages (BA's) used in calculating PD's for protein percentage (PDP%) and SNF percentages are in table 4. Averages for milk and fat on a 305-day, two-times-a-day milking, mature-equivalent basis were for first-lactation sire-identified cows calving in 1982. Averages in pounds for protein and SNF were the product of BA for milk yield (BAM) and the latest average test percentage for protein and SNF available. The PDP% was calculated the same as in the past:

$$PDP\% = [(PDP_{subset} + BAP)/(PDM_{subset} + BAM) - (BAP/BAM)] \times 100$$

where BAP = BA for protein yield. The PD SNF percentage was calculated similarly.

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[2] Norman, H. D., and Cassell, B. G. The USDA-DHIA sire evaluation procedure for protein and solids-not-fat. U.S. Dept. Agr. Prod. Res. Rpt. 178, pp. 6-10. 1979.

Table 4.--Yield averages used in calculating Predicted Difference component percentages for fat, protein, and solids-not-fat (SNF) by breed

Breed	Milk	Fat	Fat	Protein	Protein	SNF	SNF
	Pounds	*Percent*	*Pounds*	*Percent*	*Pounds*	*Percent*	*Pounds*
Ayrshire------------	12,843	3.88	499	3.29	423	8.88	1,140
Guernsey-----------	11,558	4.63	535	3.56	412	9.13	1,055
Holstein------------	17,378	3.60	625	3.15	548	8.58	1,491
Jersey--------------	11,584	4.78	553	3.79	439	9.42	1,091
Brown Swiss--------	14,293	4.00	571	3.49	499	9.13	1,305
Milking Shorthorn--	11,912	3.69	440	3.25	387	8.70	1,036
Red and White -----	15,840	3.69	585	3.18	504	8.60	1,362

Economic values used to calculate Predicted Difference dollars (PD$) for Sire Summaries and CI's for the January 1984 run were $12.40 per hundredweight (cwt) for milk with 3.5-percent fat and a differential of 17.1 cents for each 0.1-percent change from the 3.5-percent base. These prices were determined from 1983 average prices for the Nation as reported by the Economic Research Service (ERS), U.S. Department of Agriculture.[3] Average blend price for all milk sold to plants was estimated to be $13.56 per cwt for milk with 3.64-percent butterfat. Average price for 3.5-percent milk was calculated to be $13.32 per cwt. A hauling assessment of $0.45 per cwt was subtracted, and the price reduced by $0.48 to account for the mid-April through December assessment of $0.50 or $1.00 by the Government, which resulted in a price of $12.39 per cwt. This was rounded to $12.40 per cwt. The PD$ for milk and fat was calculated by

$$\text{PD\$} = \$0.06415\ (\text{PDM}) + \$1.71\ (\text{PDF})$$

where $\$0.06415 = \$0.1240 - 0.035\ (\$1.71)$.

Milk-component Sire Summaries used PD$'s derived from a base test of 3.2 percent for protein and 8.5 percent for SNF. Differentials were 12.6 cents per 0.1-percent deviation for protein and 8.8 cents per 0.1-percent deviation for SNF (95 percent of the wholesale, nonfat, dry milk price). Average powder price reported by ERS was $0.9313 per pound for 1983. The protein differential was determined from the SNF differential by dividing the SNF differential by 0.7 (the ratio of the value of SNF to the value of protein).

A higher differential for protein summaries is used because (1) protein is the most valuable part of SNF for cheese production; (2) as SNF yield increases 1 pound, protein yield increases considerably less than 1 pound; and (3) the ratio of the differentials used for protein and SNF produces approximately the same PD$ for protein (PD$ protein) and SNF (PD$ SNF) distribution, which allows for more interchange of protein and SNF evaluations. Therefore, dairy producers receiving payment for protein can select confidently among bulls with high PD$ SNF and vice versa.

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[3] U.S. Dept. Agr., Econ. Res. Serv. Dairy Outlook & Situation, DS-392-395. 1983.

The PD\$ protein was calculated by

$$\text{PD\$ protein} = \$0.02383\,(\text{PDM}) + \$1.71\,(\text{PDF}) + \$1.26\,(\text{PDP})$$

where \$0.02383 = \$0.1240 - 0.035 (\$1.71) - 0.032 (\$1.26). The PD\$ SNF was calculated by

$$\text{PD\$ SNF} = -\$0.01065\,(\text{PDM}) + \$1.71\,(\text{PDF}) + \$0.88\,(\text{PD SNF})$$

where -\$0.01065 = \$0.1240 - 0.035 (\$1.71) - 0.085 (\$0.88).

Cow Indexes Relative to the 1982 Genetic Base

Evaluating cows relative to the same base as for sires facilitates combining CI's and PD's to estimate progeny merit. Under the former base,

$$\text{CI74} = 0.5\,[w\,(\overline{\text{MCD}}_{\text{cow}}) + (1 - w)\,(\text{PD74}_{\text{sire}} + \text{CI74}_{\text{dam}})]$$

where 74 is the designation of the former base and w = the weighting factor dependent on the amount of information for the cow's average Modified Contemporary Deviation ($\overline{\text{MCD}}_{\text{cow}}$) and her parents. The intended effect of the base change was that

$$\text{CI82} = \text{CI74} - \text{BC}$$

where BC is the amount the base is changed. Note that BC was subtracted; if a base is increased by some amount, evaluations relative to that base are decreased by the same amount. For CI to be decreased by the amount of the base change, both cow data (the $\overline{\text{MCD}}_{\text{cow}}$) and parental data ($\text{PD}_{\text{sire}} + \text{CI}_{\text{dam}}$) had to decrease by 2BC because of the factor of 0.5.

The change to PD82 resulted in a decrease by BC for $\overline{\text{MCD}}_{\text{cow}}$ and PD_{sire}. The $\overline{\text{MCD}}_{\text{cow}}$ portion needed to be reduced by an additional BC because the dams of modified contemporaries were not accounted for. Ignoring those dams under the CI74 base essentially credited them with a merit of zero. If their merit were zero under CI74, then their merit under CI82 would have been -BC. Rather than simply adding a -BC after $\overline{\text{MCD}}_{\text{cow}}$ in the CI formula, specific adjustments by birth year (BY) of the cow were computed such that

$$\text{CI82} = 0.5\,[w\,(\overline{\text{MCD}}_{\text{cow}} + \text{ADC}_{\text{BY}}) + (1 - w\,(\text{PD82}_{\text{sire}} + \text{CI82}_{\text{dam}})]$$

where ADC is the adjustment for dams of contemporaries computed as the average CI74 - BC for those dams. The ADC's for selected years are in table 5. In general, these were higher than -BC. For example, the genetic base changes for Holstein PD's were 978 pounds for milk and 28 pounds for fat. Therefore, the ADC's needed just to implement the base changes were -978 and -28 pounds. Holstein ADC's were higher than those, especially for the youngest cows. Note that CI's were affected by only about 0.1 (or 0.5 w) of ADC. For a typical cow with a w of 0.20 and born in 1976, the CI milk was 17 pounds higher with the birth-year concept than by simply adjusting for the base change (using -BC as ADC); i.e., 0.5 (0.20) (-807) versus 0.5 (0.20) (-978). The effect was that CI's for current cows did not decrease as much as did PD's in changing bases. Stated differently, current cows were underevaluated under CI74, and adjusting

Table 5.--Adjustments (pounds) for dams of contemporaries (ADC's) for milk and fat yields by breed and selected birth year of cow[1]

Birth year	Ayrshire	Guernsey	Holstein	Jersey	Brown Swiss	Milking Shorthorn	Red and White
				Milk			
1970-----	-528	-735	-964	-967	-1,067	-914	-230
1976-----	-434	-649	-807	-766	-889	-695	-61
1982-----	-238	-367	-477	-459	-555	-391	-29
				Fat			
1970-----	-18	-28	-27	-33	-34	-38	-7
1976-----	-15	-24	-23	-27	-28	-29	-2
1982-----	-8	-13	-14	-16	-17	-17	0

[1] Effect on Cow Index is about 0.1 of ADC.

for that general bias increased their CI's somewhat, partially offsetting the decrease from the base change.

Mean CI's and percentages of living, registered cows above zero for CI dollars (CI$) are in table 6. Only a minority of cows have plus CI$'s. This was expected because zero was defined as the average merit of sires of first-lactation cows in 1982 and only a minority of cows would exceed that level of merit.

Table 6.--Mean Cow Indexes (CI's) for cows eligible[1] for Elite status and percentages above 0 for CI dollars (CI$) in January 1984

Breed	Mean			Percentage above CI$ of 0
	CI$	CI milk	CI fat	
		Pounds	*Pounds*	
Ayrshire------------------	-20	-149	-6	32
Guernsey-----------------	-32	-260	-9	24
Holstein------------------	-42	-377	-10	23
Jersey--------------------	-44	-350	-12	18
Brown Swiss--------------	-49	-426	-12	17
Milking Shorthorn--------	-27	-183	-9	27
Red and White -----------	5	12	3	55

[1] Meeting all requirements for Elite status without considering CI$.

The base change has altered procedures for handling situations of missing data. If no PD82 is available for the sire, -BC is used. If no CI82 is available for the dam, 0.5 (PD82 for maternal grandsire - BC) is used. If no PD82 is available for the maternal grandsire, -BC is used. The effect is to continue the assumption used with the 1974 base that merit of an unevaluated ancestor was zero. Under the 1982 base, the assumed merit is -BC.

Percentile

The reporting of percentile was extended to include all bulls and cows. Percentile ranges were derived from base population groups and then applied to all animals--living, dead, registered, and grade. Bulls with active artificial-insemination (AI) status remained the base group for bull percentiles. Registered cows calving during the last 2 years that remained in their herd and met first-stage screening requirements for Elite eligibility[4] were the base population for cow percentiles. The base group for bulls was highly selected compared with that for cows. Therefore, a bull with percentile 50 had a much higher genetic merit than a cow with percentile 50. Percentiles for cows and bulls are not comparable.

Ranges for some percentiles were not defined because of few animals or more than 1 percent of bulls with a given PD$. For bulls, the minimum for percentile 0 was the PD$ of the lowest active AI bull. Bulls with PD$'s lower than that for percentile 0 were indicated with "--." Bulls with PD$'s higher than that of any active AI bull were indicated with "++." The "++" and "--" indicators were not applied for CI$.

Tables of minimum Predicted Difference and CI$ for percentile rankings were prepared and distributed to cooperators in the National Cooperative Dairy Herd Improvement Program and will be updated each genetic evaluation run.

Incorporation of Ancestor Merit in PD82

The method of calculating the contribution of ancestor merit (AM) to PD was changed for the July 1983 Sire Summary. Group average, which is the average merit of daughters of bulls with similar pedigree indexes (PI's), was replaced by the following function of PI to represent AM:

$$AM = d + a + PI + b\,(B)$$

where d = intercept, a = difference associated with sampling through AI, b = trend by day for the Modified Contemporary Deviation (MCD) minus PI, and B = birth date = number of days after January 1, 1968. The AM procedure simplifies computations and improves the accuracy of genetic evaluations. This is particularly true for fat evaluations because ancestor fat evaluations are used directly and replace grouping based on ancestor milk evaluations. Also, group average did not adjust for birth date.

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[4] Registered and alive as indicated by last-lactation termination code and a calving within 25 months of the start of the evaluation run, at least an average of three modified contemporaries across lactations, and at least 100 days in milk if only a single lactation was used.

For January 1984 evaluations, d's were adjusted to implement PD82. The amount of adjustment depended on which ancestors had information included in the PI. No changes were made in a or b. The d's, a's, and b's are in tables 7-9 by breed for bulls with varying amounts of ancestor information. The trend (b's) is used only for bulls born in 1968 or later with complete (sire and maternal grandsire) pedigree information, and the AI difference (a's) is used only for bulls with complete pedigree information.

Table 7.--Coefficients for calculating ancestor merit of bulls with complete[1] pedigree information by breed for genetic evaluations under the 1982 genetic base

Breed	d[2]		a[3]		b[4]	
	Milk	Fat	Milk	Fat	Milk	Fat
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds/day*	*Pounds/day*
			Bulls born on or after January 1, 1968			
Ayrshire-------------	-337	-12.0	83	6.1	0.077	0.0019
Guernsey ------------	-338	-13.0	66	2.3	.098	.0028
Holstein -------------	-453	-18.3	78	3.0	.044	.0022
Jersey ---------------	-377	-16.3	199	7.8	.075	.0033
Brown Swiss---------	-331	-12.6	189	6.8	.121	.0046
Milking Shorthorn---	147	4.6	(5)	(5)	(5)	(5)
Red and White ------	-235	-12.0	78	3.0	.044	.0022
			Bulls born before January 1, 1968			
Ayrshire-------------	-354	-12.7	(5)	(5)	---	---
Guernsey ------------	-337	-13.1	79	3.1	---	---
Holstein -------------	-410	-14.0	67	2.2	---	---
Jersey ---------------	-395	-16.2	96	4.0	---	---
Brown Swiss---------	-349	-12.0	(5)	(5)	---	---
Milking Shorthorn---	-250	-10.0	(5)	(5)	---	---
Red and White ------	-192	-7.8	67	2.2	---	---

[1] Both sire and maternal grandsire pedigree information.

[2] d = intercept.

[3] a = difference associated with sampling through artificial insemination.

[4] b = trend by day of birth.

[5] Effect dropped because not significant.

Table 8.--Intercepts (d's) for calculating ancestor merit of bulls with incomplete pedigree information by breed for genetic evaluations under the 1982 genetic base

Breed	Sire pedigree information only		Maternal grandsire pedigree information only	
	Milk	Fat	Milk	Fat
	Pounds	*Pounds*	*Pounds*	*Pounds*
Ayrshire -------------	-396	-14.3	-585	-18.2
Guernsey ------------	-478	-18.6	-676	-27.7
Holstein -------------	-577	-18.8	-1,002	-30.3
Jersey ---------------	-609	-22.3	-879	-36.0
Brown Swiss ---------	-580	-19.3	-980	-28.2
Milking Shorthorn---	-539	-23.0	-403	-20.2
Red and White ------	-142	-6.3	-348	-11.6

Table 9.--Intercepts (d's) for calculating ancestor merit of bulls with no pedigree information by breed for PD82 genetic evaluations

Breed	Grade bulls		Registered bulls		Artificial-insemination bulls	
	Milk	Fat	Milk	Fat	Milk	Fat
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Ayrshire -------------	-413	-10	-922	-40	-782	-28
Guernsey ------------	-668	-30	-453	-11	-676	-27
Holstein -------------	-917	-30	-842	-25	-1,021	-33
Jersey ---------------	-896	-32	-1,046	-35	-1,046	-35
Brown Swiss ---------	-1,129	-38	-1,129	-38	-1,129	-38
Milking Shorthorn---	-930	-37	-930	-37	-930	-37
Red and White ------	-163	-8	-163	-8	-163	-8

As an example, consider a Holstein AI bull bull born on January 1, 1975, (2,555 days since January 1, 1968) and with both sire and maternal grandsire pedigree information available. His AM for milk yield would be computed as follows: His PI would be one-half his sire's PD plus one-quarter his maternal grandsire's PD. If his sire's PD was 1,500 pounds and his maternal grandsire's PD was 1,200 pounds, then the bull's PI would be 1,050 pounds. From table 7, d is -453 pounds, a is 78 pounds, and b is 0.044 pound per day for milk yield for Holsteins. The bull's AM for milk yield then would be -453 + 78 + 1,050 + 0.044 (2,555) = 787 pounds.

The effect of including b in the AM equation should be monitored because it is an extrapolation of past events into the future. If the residual genetic trend or mating practices change, this coefficient will need to be adjusted.

In implementing the base change, AM was computed for all bulls, even those not summarized in January 1984. Thus, a bull's PD74 usually differs from his PD82 by an amount different from the base change even if no new daughter information was included.

In addition, reporting of AM was extended to bulls with National Association of Animal Breeders code numbers that never have been summarized. For these bulls, AM can be considered an estimate of PD. This estimate can be used in genetic programs that evaluate merit of service sires and future herd replacements. If no daughter information is available, AM is equivalent to a PD with a Repeatability of 0.

Editing of Records

Processing date now is considered for editing records. If several records are submitted for the same lactation, cow identification, and herd during the same genetic evaluation run, the record with the most recent processing date is retained. Previously, all records so submitted were excluded because of conflicting information.

COUNTS OF 305-DAY LACTATION RECORDS EXCLUDED FROM GENETIC EVALUATIONS FOR 1983

By George R. Wiggans and David R. Ostrander[1]

Lactation records for cows enrolled in production testing plans of the National Cooperative Dairy Herd Improvement Program (NCDHIP) are sent to the Animal Improvement Programs Laboratory by the dairy records processing centers. Some of these records are not included in genetic evaluations. The only ones used are those with yield within edit limits, with sire identification, and from supervised plans approved by the Policy Board of NCDHIP for use in sire evaluation.

Table 1 gives the number of 305-day records excluded from the July 1983 and January 1984 Sire Summaries by State. Data for these two Summaries represent approximately 1 calendar year's data. Completed or terminated records of fewer than 305 days are considered 305-day records. The number of records received from a State may have exceeded the number of cows on test in that State because (1) a record for the same lactation was submitted more than once because of corrections, (2) a cow completed two 305-day records in one 12-month period, or (3) a cow's ownership changed. The number of official 305-day records excluded after comparison with previously submitted records is included in tables 1 and 2 under the column heading "Conflict."

Nearly 26 percent of 305-day lactation records were excluded from genetic evaluations because they were from nonofficial plans, about the same as for 1982.[2] All but seven States--Alaska, Kansas, Maine, Missouri, Nebraska, New Jersey, and Texas--had an increase in percentage of records that were available for genetic evaluations. The decreases for the seven States ranged from 0.1 to 3.4 percent. Two States--New Mexico and South Carolina--had an increase in proportion of records used by over 5.0 percent.

Table 2 summarizes the data for the 10 States in table 1 with the most official records. Of these 10 States, 4 had less than 40.0 percent and 2 had more than 60.0 percent of their official records excluded. Most States had little change from 1982. The national average was 47.1 percent excluded, down from 49.0 percent for 1982.

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[2] Wiggans, G. R., and King, G. J. Counts of 305-day lactation records excluded from genetic evaluations, 1982. U.S. Dept. Agr. Dairy Herd Impr. Ltr. 59(2), pp. 1-4. 1983.

Table 1.--Disposition of 305-day records by State, 1983

State[1]	Records			Official records excluded because of--				Official 305-day records available for Sire Summary	
	Total	Nonofficial[2]	Official	Termination code 9[3] [4]	Zero sire No.	Error[5]	Conflict[6]		
	Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Percent*
Alabama ----------	25,121	968	24,153	393	13,717	8	686	9,349	38.7
Alaska ------------	199	115	84	2	0	0	2	80	95.2
Arizona -----------	58,573	2,947	55,626	1,055	37,356	220	1,457	15,538	27.9
Arkansas----------	19,871	2,755	17,116	2,050	7,821	25	584	6,636	38.8
California---------	570,900	46,879	524,021	20,235	278,481	2,128	15,304	207,873	39.7
Colorado----------	37,464	3,359	34,105	557	17,126	436	1,456	14,530	42.6
Connecticut-------	30,220	4,945	25,275	0	6,647	32	963	17,633	69.8
Delaware ---------	5,215	513	4,702	0	1,595	3	172	2,932	62.4
Florida------------	66,827	48,442	18,385	439	10,628	39	748	6,531	35.5
Georgia -----------	57,114	17,944	39,170	792	20,891	21	1,147	16,319	41.7
Hawaii ------------	7,299	3,619	3,680	106	2,157	7	36	1,374	37.3
Idaho--------------	59,395	6,501	52,894	1,209	30,423	1,415	1,839	18,008	34.0
Illinois ------------	95,847	13,005	82,842	5,647	30,021	293	3,364	43,517	52.5
Indiana------------	71,283	13,776	57,507	779	17,758	99	2,100	36,771	63.9
Iowa---------------	155,182	68,353	86,829	5,348	28,733	161	4,010	48,577	55.9
Kansas ------------	64,113	5,463	58,650	4,564	21,171	114	2,497	30,304	51.7
Kentucky----------	44,532	8,029	36,503	517	18,372	25	1,132	16,457	45.1
Louisiana ---------	29,528	696	28,832	792	14,618	30	825	12,567	43.6
Maine -------------	30,150	4,984	25,166	0	4,787	72	1,004	19,303	76.7
Maryland----------	58,308	2,871	55,437	791	14,411	336	2,119	37,780	68.1
Massachusetts ----	21,491	2,041	19,450	1	3,191	35	698	15,525	79.8
Michigan----------	198,389	54,180	144,209	1,104	65,846	100	6,090	71,069	49.3
Minnesota---------	380,011	126,553	253,458	11,589	84,154	90	8,496	149,129	58.8
Mississippi --------	29,100	514	28,586	488	16,695	15	676	10,712	37.5
Missouri-----------	82,607	12,099	70,508	7,325	30,510	82	2,755	29,836	42.3
Montana ----------	11,376	1,705	9,671	207	5,752	132	370	3,210	33.2
Nebraska----------	46,602	5,182	41,420	3,573	19,761	89	1,465	16,532	39.9
Nevada------------	12,647	384	12,263	546	7,425	318	236	3,738	30.5
New Hampshire---	17,196	2,514	14,682	22	2,323	22	661	11,654	79.4
New Jersey -------	18,210	3,234	14,976	0	3,620	25	553	10,778	72.0
New Mexico ------	38,316	10,332	27,984	757	15,556	186	760	10,725	38.3
New York---------	445,670	222,892	222,778	4	41,829	353	7,453	173,139	77.7
North Carolina ---	77,898	8,931	68,967	1,065	30,277	90	2,828	34,707	50.3
North Dakota-----	15,565	3,006	12,559	1,201	6,793	11	439	4,115	32.8
Ohio---------------	146,141	38,071	108,070	1,788	29,933	963	4,782	70,604	65.3
Oklahoma---------	30,483	2,672	27,811	2,194	13,367	23	1,249	10,978	39.5
Oregon------------	57,319	6,476	50,843	3,307	21,960	379	2,062	23,135	45.5
Pennsylvania------	326,617	102,952	223,665	2,122	47,266	2,745	7,584	163,948	73.3
Puerto Rico-------	30,311	500	29,811	822	25,879	67	372	2,671	9.0
Rhode Island------	1,465	0	1,465	1	378	0	56	1,030	70.3
South Carolina----	33,103	1,721	31,382	598	12,081	14	750	17,939	57.2
South Dakota -----	46,060	24,575	21,485	1,154	10,877	27	627	8,800	41.0
Tennessee---------	65,109	780	64,329	653	38,847	14	1,454	23,361	36.3
Texas -------------	97,812	9,866	87,946	2,061	55,147	56	2,019	28,663	32.6
Utah --------------	46,590	3,403	43,187	1,303	23,044	307	1,581	16,952	39.3
Vermont----------	83,347	19,405	63,942	2	14,938	140	2,301	46,561	72.8
Virginia ----------	96,790	3,133	93,657	1,293	26,435	123	3,911	61,895	66.1
Washington -------	104,340	11,603	92,737	1,737	45,395	880	3,725	41,000	44.2
West Virginia -----	14,324	991	13,333	1	3,453	5	504	9,370	70.3
Wisconsin ---------	665,415	282,275	383,140	12,037	132,915	1,637	15,025	221,526	57.8
Wyoming----------	2,597	184	2,413	83	1,050	192	108	980	40.6
United States-----	4,730,042	1,218,338	3,511,704	104,314	1,413,410	14,584	123,035	1,856,361	52.9

[1] Includes Puerto Rico.

[2] Includes records with invalid identification correction codes.

[3] Includes a few records unusable for reasons other than termination code 9; e.g., test herd, invalid termination code, or missing or unreasonable birth or calving date.

[4] Values also affected by procedures of individual dairy records processing centers. For example, the New York center submits very few records with termination code 9. In contrast, the Iowa center submits many such records.

[5] Includes records with invalid or missing animal identification or production information.

[6] Includes records that conflict with previously submitted records or pedigree data in the Animal Improvement Programs Laboratory file; also includes records having production values outside U.S. Department of Agriculture limits.

Table 2.--Official 305-day records and proportion excluded for 10 States with most official records and for United States, 1983

State	Official records	Official records excluded because of-- Termination code 9	Zero sire No.	Error	Conflict	Total official records excluded
	Number	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
California---------	524,021	3.9	53.1	0.4	2.9	60.3
Wisconsin ---------	383,140	3.1	34.7	.4	3.9	42.2
Minnesota---------	253,458	4.6	33.2	.0	3.4	41.2
Pennsylvania------	223,665	.9	21.1	1.2	3.4	26.7
New York ---------	222,778	.0	18.8	.2	3.3	22.3
Michigan ----------	144,209	.8	45.7	.1	4.2	50.7
Ohio ---------------	108,070	1.7	27.7	.9	4.4	34.7
Virginia -----------	93,657	1.4	28.2	.1	4.2	33.9
Washington -------	92,737	1.9	49.0	.9	4.0	55.8
Texas -------------	87,946	2.3	62.7	.1	2.3	67.4
United States-----	3,511,704	3.0	40.2	.4	3.5	47.1

Among official records, 3.0 percent were unusable because of termination code 9, down from 3.1 percent for 1982. (Termination code 9 indicates that a record should not be used for genetic evaluations because production information is not reliable or the record did not conform to Official Dairy Herd Improvement Rules.) Approximately 40 percent of official records had missing sire identification, which was the primary reason for exclusion, down from approximately 42 percent in 1982. Only 0.4 percent of official records were excluded because of errors, the same as for 1982. The number excluded because of errors varied considerably among States. Missing birth dates and missing animal identification were the primary causes of errors for States with large numbers of records with errors. About 3.5 percent of official records were excluded because of conflicts, down from 3.7 percent for 1982.

If a record was not used in computing genetic evaluations for a reason other than conflict, such as missing sire identification, only that record was excluded. However, when a record was compared with other records for the same cow and a conflict, such as differing birth date or parent identification, was detected, all records for that cow were excluded, including incoming records and all records already in the Animal Improvement Programs Laboratory files.

Summary

Official 305-day records provide the basic information for genetic evaluation of dairy cattle. Although completeness and accuracy of identification and other information in lactation records are improving slowly, the number of official records that contribute to genetic evaluations could be nearly doubled if **all** records received had complete animal identification and no conflicts. Careful review of records returned because of conflict may enable correction of errors and restoration of information.

STATE AND NATIONAL STANDARDIZED LACTATION AVERAGES BY BREED FOR COWS ON OFFICIAL TEST, CALVING IN 1982

By Rex L. Powell[1]

Dairy records processing centers provide lactation records to the U.S. Department of Agriculture for research that includes genetic evaluations. Records only from cows on official test are used in genetic evaluations. Nearly half of the official records are not used. Most of them are from grade cows and are not usable because of missing sire identification and failure to pass other USDA edits.[2] [3]

The number and average standardized yields of lactation records initiated in 1982 and eligible to contribute to genetic evaluations[4] are reported by State in table 1 for Ayrshire, Guernsey, and Holstein cows and in table 2 for Jersey, Brown Swiss, and Milking Shorthorn cows. Records were standardized for age and month of calving[5] and times milked per day.[6] Records of fewer than 305 days were projected to 305 days[7] regardless of reason for termination. Thus, the averages presented are on a 305-day, two-times-a-day, mature-equivalent basis. Fat percentages were computed from the average standardized milk and fat yields.

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[1] Research geneticist (animal), Animal Improvement Programs Laboratory, Animal Science Institute, Beltsville Agricultural Research Center, Beltsville, Md. 20705.

[2] Wiggans, G. R., and Ostrander, D. R. Counts of 305-day lactation records excluded from genetic evaluations for 1983. U.S. Dept. Agr. Dairy Herd Impr. Ltr. 60(2), pp. 13-15. 1984.

[3] U.S. Department of Agriculture. Editing of lactation records used in USDA-DHIA genetic evaluations of sires and cows. U.S. Dept. Agr. Dairy Herd Impr. Ltr. ARS-44-222, 46(6), 32 pp. 1970.

[4] Because some lactation data included here may have been from cows without herdmate records, their records were not used in genetic evaluations.

[5] Norman, H. D., Miller, P. D., McDaniel, B. T., and others. USDA-DHIA factors for standardizing 305-day lactation records for age and month of calving. U.S. Dept. Agr. ARS-NE-40, 91 pp. 1974.

[6] Wiggans, G. R., and Grossman, M. Adjusting records from three-times-a-day to two-times-a-day milking basis. U.S. Dept. Agr. Dairy Herd Impr. Ltr. 56(4), pp. 7-8. 1980.

[7] Wiggans, G. R., and Powell, R. L. Projection factors for milk and fat lactation records. U.S. Dept. Agr. Dairy Herd Impr. Ltr. 56(1), 15 pp. 1980.

Table 1.--Number of records and State and national standardized lactation averages for Ayrshire, Guernsey, and Holstein cows on official test, calving in 1982, and with identified sires

State[1]	Ayrshire				Guernsey				Holstein			
	Records	Milk	Fat	Fat	Records	Milk	Fat	Fat	Records	Milk	Fat	Fat
	Number	*Pounds*	*Percent*	*Pounds*	*Number*	*Pounds*	*Percent*	*Pounds*	*Number*	*Pounds*	*Percent*	*Pounds*
Alabama	33	12,482	3.74	467	77	11,108	4.21	468	6,260	16,180	3.49	564
Alaska	---	---	---	---	---	---	---	---	69	15,560	3.59	559
Arizona	---	---	---	---	459	12,636	4.62	583	11,346	18,330	3.63	666
Arkansas	2	9,680	3.76	364	146	9,918	4.42	438	4,779	15,789	3.38	534
California	214	14,149	3.75	530	2,108	13,320	4.64	618	183,734	19,434	3.58	695
Colorado	6	14,485	4.11	595	241	10,323	4.38	452	12,281	17,165	3.51	603
Connecticut	529	13,158	4.01	528	472	12,111	4.64	563	15,010	18,054	3.58	647
Delaware	87	14,282	4.28	611	12	13,636	4.86	662	2,521	18,549	3.65	677
Florida	204	11,588	3.53	409	182	11,792	4.31	508	4,258	16,197	3.25	527
Georgia	199	11,760	3.65	429	811	11,100	4.61	512	12,134	16,290	3.45	562
Hawaii	---	---	---	---	---	---	---	---	1,254	16,025	3.08	494
Idaho	102	12,001	3.97	476	286	11,649	4.72	549	15,016	17,403	3.50	609
Illinois	500	12,041	3.89	469	1,156	10,945	4.62	506	36,699	16,493	3.64	601
Indiana	375	13,096	3.88	508	2,546	11,660	4.76	556	29,455	17,177	3.65	628
Iowa	1,283	12,324	3.94	486	1,948	10,957	4.73	518	35,872	16,246	3.63	591
Kansas	469	11,428	3.77	430	511	11,048	4.45	492	26,680	15,878	3.55	564
Kentucky	164	12,138	3.85	468	272	10,856	4.49	488	12,514	16,194	3.58	580
Louisiana	97	10,727	3.61	388	1,025	10,162	4.29	436	8,267	15,321	3.36	514
Maine	549	12,653	3.89	492	259	12,050	4.50	543	15,517	17,873	3.56	637
Maryland	709	11,333	3.91	443	992	10,930	4.65	508	33,380	17,151	3.64	624
Massachusetts	429	12,722	3.95	503	307	12,189	4.54	553	12,443	17,557	3.63	637
Michigan	220	12,717	3.82	486	1,676	11,772	4.69	552	61,557	17,690	3.64	645
Minnesota	1,080	12,730	3.92	499	3,978	11,081	4.71	522	130,445	16,676	3.64	607
Mississippi	147	11,380	3.63	413	206	11,640	4.35	507	7,867	15,564	3.41	531
Missouri	68	12,090	3.77	456	1,557	10,628	4.53	482	24,139	16,275	3.54	576
Montana	189	14,786	3.64	538	68	13,541	4.85	656	2,802	16,750	3.51	588
Nebraska	174	11,166	3.87	432	477	10,759	4.63	499	13,933	15,357	3.64	559
Nevada	---	---	---	---	---	---	---	---	2,961	17,961	3.52	632
New Hampshire	575	13,629	3.86	526	110	11,450	4.60	527	8,937	17,868	3.61	645
New Jersey	15	14,397	3.90	561	131	11,558	4.63	536	9,742	18,017	3.57	643
New Mexico	181	15,191	3.81	578	373	12,591	4.45	560	9,593	20,020	3.43	687
New York	3,030	13,246	3.92	519	1,694	11,741	4.56	535	152,091	17,610	3.62	637
North Carolina	273	13,957	3.58	500	476	11,216	4.69	527	30,423	17,411	3.47	603
North Dakota	2	11,865	4.52	537	16	8,284	4.64	384	3,557	15,510	3.60	559
Ohio	1,168	12,975	3.85	500	2,369	11,992	4.64	556	54,615	17,907	3.64	652
Oklahoma	255	12,830	3.59	460	341	11,299	4.59	519	7,925	16,611	3.50	581
Oregon	152	14,551	3.87	563	991	12,642	4.50	568	15,148	18,602	3.54	659
Pennsylvania	1,303	13,765	3.96	545	4,319	12,110	4.62	560	148,599	17,693	3.64	643
Puerto Rico	1	8,130	2.88	234	---	---	---	---	2,294	11,104	3.06	339
Rhode Island	169	12,977	3.98	516	18	7,381	4.46	329	712	17,231	3.55	612
South Carolina	---	---	---	---	1,546	11,995	4.59	551	10,157	16,680	3.54	590
South Dakota	1	4,140	4.86	201	65	11,973	4.88	584	7,168	15,912	3.58	570
Tennessee	107	12,867	3.82	491	477	11,554	4.49	519	16,832	17,578	3.51	617
Texas	34	11,106	3.79	421	296	11,724	4.48	526	20,120	17,438	3.47	605
Utah	9	11,372	3.86	439	11	11,476	4.43	508	15,022	18,138	3.38	613
Vermont	1,372	13,298	3.83	509	520	11,784	4.52	532	34,720	17,380	3.57	621
Virginia	647	13,121	3.73	490	1,581	11,343	4.53	514	57,055	16,913	3.50	592
Washington	327	14,593	3.93	574	1,830	12,951	4.75	615	32,553	19,311	3.51	678
West Virginia	316	12,199	3.80	464	206	10,410	4.47	466	7,924	16,488	3.55	586
Wisconsin	1,269	12,973	3.94	511	6,576	11,590	4.76	551	187,211	17,183	3.74	643
Wyoming	---	---	---	---	21	14,103	4.48	632	868	16,403	3.38	554
United States	19,035	12,937	3.87	501	45,739	11,656	4.64	541	1,556,459	17,509	3.60	631

[1] Puerto Rican data are included in U.S. Department of Agriculture national standardized lactation averages.

Table 2.--Number of records and State and national standardized lactation averages for Jersey, Brown Swiss, and Milking Shorthorn cows on official test, calving in 1982, and with identified sires

State[1]	Jersey				Brown Swiss				Milking Shorthorn			
	Records	Milk	Fat	Fat	Records	Milk	Fat	Fat	Records	Milk	Fat	Fat
	Number	*Pounds*	*Percent*	*Pounds*	*Number*	*Pounds*	*Percent*	*Pounds*	*Number*	*Pounds*	*Percent*	*Pounds*
Alabama	2,519	12,458	4.60	573	135	12,753	4.14	528	10	11,827	3.77	446
Alaska	---	---	---	---	---	---	---	---	---	---	---	---
Arizona	1,260	12,888	5.02	647	765	15,823	3.96	626	80	12,563	3.46	435
Arkansas	803	10,117	4.71	476	173	14,100	3.85	542	66	13,728	3.63	499
California	9,037	12,536	5.02	630	956	15,760	4.07	642	162	13,557	3.56	482
Colorado	281	11,929	4.78	571	608	13,605	4.18	568	1	10,110	3.72	376
Connecticut	420	11,257	4.95	557	272	14,681	3.87	569	19	10,898	3.45	377
Delaware	83	11,326	4.88	552	9	15,668	4.03	631	---	---	---	---
Florida	922	11,984	4.34	520	260	14,671	3.60	528	---	---	---	---
Georgia	2,063	10,448	4.56	477	378	14,153	3.69	522	---	---	---	---
Hawaii	---	---	---	---	---	---	---	---	---	---	---	---
Idaho	1,189	11,214	4.85	544	176	14,710	3.93	578	59	14,258	3.67	524
Illinois	1,053	9,960	4.75	474	1,466	13,107	4.03	528	213	11,449	3.65	418
Indiana	1,802	11,243	4.84	545	851	15,069	4.05	610	77	12,331	3.69	455
Iowa	2,449	11,031	4.75	524	2,920	13,401	4.05	543	388	11,429	3.70	423
Kansas	734	10,141	4.52	458	391	12,680	3.86	490	29	12,121	3.45	418
Kentucky	2,251	11,127	4.72	525	268	13,903	3.78	525	11	8,953	3.81	341
Louisiana	2,417	10,066	4.57	460	136	10,502	3.66	385	---	---	---	---
Maine	1,458	12,839	4.79	615	111	13,590	3.81	517	128	11,001	3.54	390
Maryland	429	10,047	4.81	482	264	13,444	4.04	543	35	10,396	3.63	378
Massachusetts	1,208	11,370	4.96	564	79	13,142	3.95	519	18	11,596	3.66	425
Michigan	2,041	11,447	4.95	567	361	14,222	4.03	573	52	12,224	3.58	438
Minnesota	2,949	10,660	4.93	525	1,537	13,892	4.10	570	587	13,131	3.76	494
Mississippi	2,042	10,526	4.46	470	12	12,188	3.91	476	---	---	---	---
Missouri	1,723	10,998	4.70	517	563	13,122	4.01	525	150	12,356	3.63	448
Montana	9	10,057	4.70	467	53	14,174	4.15	588	---	---	---	---
Nebraska	196	9,140	4.71	430	621	13,217	4.14	547	207	8,485	3.69	313
Nevada	530	13,681	4.85	664	2	10,755	4.38	440	---	---	---	---
New Hampshire	1,165	11,616	4.82	560	147	12,564	3.96	498	38	12,149	3.56	432
New Jersey	257	13,840	4.46	617	154	13,561	3.97	538	---	---	---	---
New Mexico	2	10,540	3.43	361	5	15,294	4.21	644	---	---	---	---
New York	5,239	11,235	4.92	553	1,546	14,404	4.01	578	32	12,478	3.61	451
North Carolina	2,170	11,907	4.80	572	301	13,309	3.95	526	1	12,990	2.95	383
North Dakota	120	9,765	4.60	449	175	14,109	4.11	581	2	12,700	4.10	521
Ohio	6,049	11,380	4.91	559	1,731	15,129	4.08	617	243	10,987	3.73	410
Oklahoma	951	11,141	4.70	524	405	12,731	3.88	494	284	12,669	3.52	446
Oregon	3,987	12,277	4.85	596	693	14,865	3.97	590	12	17,160	3.78	650
Pennsylvania	5,298	11,345	4.77	541	935	15,201	4.00	608	56	12,076	3.71	448
Puerto Rico	---	---	---	---	28	11,171	3.16	353	---	---	---	---
Rhode Island	40	12,396	4.64	575	1	13,440	3.68	495	---	---	---	---
South Carolina	5,293	11,954	4.75	568	19	11,425	3.61	416	---	---	---	---
South Dakota	102	10,073	4.70	474	517	13,158	3.98	523	104	11,146	3.51	392
Tennessee	4,624	11,680	4.64	542	404	15,447	3.99	616	2	11,855	4.01	475
Texas	5,715	10,922	4.66	509	1,234	14,322	3.91	561	35	10,383	3.86	401
Utah	703	11,652	4.70	548	127	13,721	3.90	535	1	20,760	3.69	767
Vermont	7,016	11,436	4.82	551	136	16,618	4.02	669	29	13,097	3.55	466
Virginia	873	11,765	4.68	551	193	13,955	3.83	534	13	12,295	3.66	451
Washington	3,946	12,959	4.98	645	196	15,920	3.90	622	32	16,875	3.62	612
West Virginia	299	11,298	4.58	518	18	10,005	3.98	399	---	---	---	---
Wisconsin	3,748	10,802	4.97	537	4,197	14,060	4.12	579	318	12,017	3.68	442
Wyoming	12	10,647	5.00	532	1	16,800	3.39	569	---	---	---	---
United States	99,477	11,522	4.81	554	26,530	14,126	4.02	568	3,494	12,023	3.65	439

[1] Puerto Rican data are included in U.S. Department of Agriculture national standardized lactation averages.

Tables 1 and 2 were compared with corresponding tables for 1981 calvings.[8] The numbers of records increased 6 percent overall and for Holsteins, 7 percent for Jerseys, and 2 percent for Milking Shorthorns. The number of Brown Swiss records remained nearly the same as in 1981. The number of records declined 3 percent for Ayrshires and 6 percent for Guernseys. Average milk and fat yields increased for all breeds. Fat percentage generally decreased slightly.

The number of records and national average production are in table 3 by breed for selected years from 1970 through 1982. The total number of records increased 75 percent since 1970.[9] Percentage increases were largest for Holsteins and intermediate for Jersey, Brown Swiss, and Milking Shorthorns. Ayrshires essentially have maintained their number, whereas Guernseys have decreased. Average annual increases in milk yield since 1970 were from 113 pounds for Ayrshires and Brown Swiss to 212 pounds for Holsteins. Average annual increases in fat yield ranged from 4 pounds for Ayrshires and Brown Swiss to 7 pounds for Holsteins. Average fat percentage decreased for all breeds, especially for Jerseys.

Information for Red and White cows is not included in tables 1 and 2 and for some years in table 3 because of the small number of cows for that breed. Nationally the 2,118 Red and White cows averaged 15,986 pounds of milk, 3.66 percent fat, and 585 pounds of fat. The averages for 1,240 cows in 1981 were 16,152 pounds of milk, 3.62 percent fat, and 584 pounds of fat.

Interpretation of changes in average yield should be made in view of the many factors that can affect it. Although genetic change is expected to have a positive effect on yield, the feed availability and cost, the milk and beef prices, and the characteristics of herds entering and leaving official testing programs can affect the averages in either direction.

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[8] Powell, R. L. State and national standardized lactation averages by breed for cows on official test, calving in 1981. U.S. Dept. Agr. Dairy Herd Impr. Ltr. 59(4), 6 pp. 1983.

[9] Data from earlier years are from current computations rather than previous publications.

Table 3.--Number of records and national average yield by breed for cows calving from 1970 to 1982

Breed	Year of calving					Average annual change	
	1970	1973	1976	1979	1982	Amount	Percentage
				Records (numbers)			
Ayrshire	19,642	18,593	18,547	19,433	19,035	-51	-0.26
Guernsey	81,026	69,378	59,069	51,572	45,739	-2,941	-3.63
Holstein	804,029	913,470	1,063,259	1,269,024	1,556,459	62,703	7.80
Jersey	74,223	71,228	74,316	83,224	99,477	2,105	2.84
Brown Swiss	21,026	20,810	22,801	24,146	26,530	459	2.18
Milking Shorthorn	2,699	2,436	2,660	3,004	3,494	66	2.45
Red and White	---	---	181	939	2,118	---	---
				Milk (pounds)			
Ayrshire	11,577	11,483	12,220	12,602	12,937	113	.98
Guernsey	10,205	10,266	11,065	11,296	11,656	121	1.18
Holstein	14,966	15,022	16,354	16,909	17,509	212	1.42
Jersey	9,504	9,729	10,603	11,006	11,522	168	1.77
Brown Swiss	12,773	12,823	13,664	13,772	14,126	113	.88
Milking Shorthorn	10,442	10,484	11,513	11,691	12,023	132	1.26
Red and White	---	---	13,959	15,437	15,986	---	---
				Fat (percent)			
Ayrshire	3.92	3.91	3.93	3.88	3.87	-.004	-.11
Guernsey	4.69	4.64	4.63	4.63	4.64	-.004	-.09
Holstein	3.65	3.65	3.65	3.61	3.6	-.004	-.11
Jersey	5.03	4.95	4.89	4.85	4.81	-.018	-.36
Brown Swiss	4.05	4.00	3.99	4.01	4.02	-.003	-.06
Milking Shorthorn	3.68	3.65	3.61	3.63	3.65	-.003	-.07
Red and White	---	---	3.57	3.63	3.66	---	---
				Fat (pounds)			
Ayrshire	454	449	480	489	501	4	.86
Guernsey	479	476	513	523	541	5	1.08
Holstein	547	549	597	611	631	7	1.28
Jersey	478	482	518	533	554	6	1.32
Brown Swiss	517	513	545	552	568	4	.82
Milking Shorthorn	385	383	416	425	439	5	1.17
Red and White	---	---	499	561	585	---	---

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